Theoretical fundamentals of chemistry.

Subject and problems of chemistry. The place of chemistry and its value for medico biological disciplines.


Structure of atomic nuclei of chemical elements. Isotopes.

The doctrine about periodicity.

Periodic law and periodic system of elements of D. I. Mendeleyev.

Periodic law of chemical elements of D. I. Mendeleyev. Distribution of electrons in atoms of elements of the first four periods. s,p,d-elements. Periods, groups and subgroups. The characteristic of separate chemical elements on the basis of situation in periodic system and an atom structure.

Chemical bond.


Speed of chemical reactions and her dependence on various factors. Constant of speed of chemical reactions. Catalysis. Reversibility of chemical reactions. Chemical balance and conditions of his shift.

Solutions


Inorganic chemistry.

Classes of inorganic compounds.


Halogens.

General characteristic of elements of the main subgroup of the VII group.


Subgroup of oxygen.

General characteristic of elements of the main subgroup of the VII group.


Sulfur. Allotropic modifications are gray. Physical and chemical properties are gray. Connections are gray: hydrogen sulfide, oxide of sulfur (VI), (IV). Sulfuric acid, its properties, chemical bases of production. Biologically active connections containing sulfur.

Subgroup of nitrogen.


Subgroup of carbon.

General characteristic of elements of the main subgroup of the IV group,


Hydrogen and water.


Metals.

Location in periodic system. Features of a structure of their atoms. Metal communication. Typical physical and chemical properties. General ways of producing metals.

General characteristic of elements of the main subgroups of I, II groups.


Organic chemistry.

Structure of organic compounds.

Basic points of the theory of a chemical structure of A.M. Butlerov.
Dependence of properties of substances on their chemical structure. Isomerism. The electronic nature of chemical bonds in molecules of organic compounds, ways of a rupture of communications, concept about free radicals.
**Saturated hydrocarbons.**


**Unsaturated hydrocarbons.**


**Alkadienes.** Features of an electronic structure and chemical properties of alkadienes with the interfaced double communications (on the example of butadiene-1,3 and its homologs). Polymerization of an isoprene and butadiene-1,3 (natural and synthetic rubbers). Producing butadiene-1,3.


**Aromatic hydrocarbons (arenes).**


**Interrelation of saturated, unsaturated and aromatic hydrocarbons.**

Comparative characteristic of reactionary ability of unsaturated hydrocarbons. Natural sources of hydrocarbons.

**Alcohols, phenols, aldehydes.**


**Phenol,** structure, physical properties. Chemical properties of phenol. Comparative characteristic of acid properties of phenol and alcohols. Medicobiological value of phenol and alcohols.
**Aldehydes and ketones.**


**Carbonic acids.**


**Esters. Fats.**


**Carbohydrates.**


**Reducing and non-reducing disaccharides** (maltose, cellose, lactose, sucrose). Structure, properties, relation to hydrolysis.

**Polysaccharides.** Amylum (amylase and amylopectin), cellulose. Structure, chemical properties. Usage cellulose derivates. Medicobiological value of carbohydrates.

**Amines. Nitrogen-containing heterocyclic compounds.**


**Amino acids. Peptides, proteins.**


**Nucleic acids.**

Structure and structure of nucleosides and nucleotides of RNA and DNA. Relation of nucleosides and nucleotides to hydrolysis. Adenosine - 5 triphosphate. Primary structure of RNA and DNA. The principle complementary in creation of a double spiral of DNA. A role of nucleinic acids in activity of live organisms.

**High-molecular compounds.**

General concept of chemistry of high-molecular compounds: monomer, polymer, structural link, degree of polymerization, average relative molecular mass. Reactions of polymerization and polycondensation. Dependence of properties of polymers on their structure. Structure of polyethylene, polypropylene, polystyrene, polyvinylchloride, teflon, kapron, lavsan, acetate fiber. Use of polymers materials in medicine.

**Standard calculation tasks**

**Calculations:**

- fraction of total mass, volume fraction or molar concentration of a component;
- the relative density of substance in a gaseous state;
- the volume of gaseous substance of the known weight or quantity under various conditions;
- the masses (volume, amount of substance) of one of participants of reaction on the known mass (volume, amount of substance) of other participant of reaction;
- the same with preliminary finding lack of substance or which of substances is much;
- the same, taking into account a product yield in reaction in percentage terms of theoretically possibility;
- the same, taking into account a mass fraction of admixtures in one of reagents of chemical reaction;
- determination of a molecular formula of substance on a mass fraction of chemical element or on the mass of combustion products;
- definition of salt structure from the mass or amount of the reacting substances;
- complex challenges include two or more the listed standard tasks;
- multistage synthesis of organic or inorganic substances.

Chairman of the Examination Board, professor

Avkhutskaya G.S.
Evaluation criteria of the Verbal Answer
for the Chemistry Entrance Examination
at the First Pavlov State Medical University of St. Petersburg

The answer is evaluated according to the 100 point system. You can get 20 points (maximum) for each question.

**BLOCKS 1-3**
You can get 4 points (maximum) for each of 5 questions;
2 points - for the right chosen answer;
From 1 to 2 points - for a full explanation to the answer.

**BLOCK 4**
You can get 5 points (maximum) for each of 4 questions;
2 points — for the right chosen answer;
From 1 to 3 points - for correctly written chemical equation.

**BLOCK 5**
A correctly solved task is evaluated at 20 points.
10 points - for correctly written chemical equation and (or) a design formula.
From 1 to 10 points depending on the volume and correctness of the calculations.